

CLAIMS

What is claimed is:

- 1 1. A method for fabrication of magnetic write heads for disk drives, comprising:
 - 2 A) forming a P1 layer having a P1 Protrusion, said P1 Protrusion having a
3 longitudinal axis;
 - 4 B) depositing a gap layer on said P1 Protrusion;
 - 5 C) forming a fill material layer on said gap layer, said fill material layer being
6 shaped to form a mold mask which surrounds a hollow which is substantially aligned
7 with said longitudinal axis of said P1 Protrusion; and
 - 8 D) filling said hollow in said fill material layer with P2 pole material to form
9 a P2 pole which is substantially aligned with said P1 Protrusion.
- 1 2. The method of fabrication of claim 1, further comprising:
 - 2 E) removing said fill layer material to leave a P1/gap/P2 structure;
 - 3 F) trimming said P1/gap/P2 structure to obtain the final track width;
 - 4 G) filling around said P1/gap/P2 structure with a second fill material; and
 - 5 H) removing portions of said second fill material to expose said P2 pole.
- 1 3. The method of fabrication of claim 1, wherein A) further comprises:
 - 2 i) depositing an N3 layer of high magnetic moment material on said
3 P1 layer; and
 - 4 ii) forming a P1 Protrusion on said N3 layer.

1 4. The method of fabrication of claim 2, wherein ii) further comprises:
2 1) applying, exposing and developing photoresist to create a
3 pattern for said P1 Protrusion;
4 2) plating pole material into the photo-resist pattern to form
5 said P1 Protrusion; and
6 3) stripping said photo-resist.

1 5. The method of fabrication of claim 1, wherein:
2 said P1 pole material is chosen from a group consisting of CoFe, NiFe, CoFeN,
3 CoNiFe and high magnetic moment materials.

1 6. The method of fabrication of claim 3, wherein:
2 said N3 layer material is chosen from a group consisting of CoFe, NiFe, CoFeN,
3 CoNiFe and high magnetic moment materials.

1 7. The method of fabrication of claim 3, wherein:
2 said P1 Protrusion pole material is chosen from a group consisting of CoFe, NiFe,
3 CoFeN, CoNiFe and high magnetic moment materials.

1 8. The method of fabrication of claim 1, wherein:
2 said gap layer material is chosen from a group consisting of Al₂O₃, SiO₂, Ta, Rh,
3 Ta/Rh, Pd and Ru.

1 9. The method of fabrication of claim 1, wherein:
2 said fill layer material is chosen from a group consisting of SiO₂, Si₃N₄, SiC, and
3 TaC.

1 10. The method of fabrication of claim 1, wherein C) further comprises:
2 i) forming a RIE mask on said fill layer, said mask maintaining
3 substantial alignment with said longitudinal axis of said P1 Protrusion;
4 ii) etching by RIE to remove fill layer material to form a hollow
5 which is substantially aligned with said longitudinal axis of said P1 Protrusion;
6 and
7 iii) removing said RIE mask.

1 11. The method of claim 10, wherein:
2 said RIE mask material is chosen from a group consisting of NiFe, Ta, W and Cr.

1 12. The method of claim 1, wherein:
2 said P2 pole material is chosen from a group consisting of CoFe, NiFe, CoFeN,
3 and CoNiFe.

1 13. The method of claim 2, wherein:
2 said second fill material is chosen from a group consisting of Al₂O₃, SiO₂, Si₃N₄
3 and SiC.

1 14. The method of claim 1, wherein D) further comprises:

- 2 i) plating with P2 pole material to form a mushroom portion; and
- 3 ii) performing CMP to remove said mushroom portion.

1 15. The method of claim 2, wherein E) comprises:

- 2 i) etching by using RIE to remove said fill layer material.

1 16. The method of claim 2, wherein F) comprises:

- 2 i) using ion milling to trim said P1/gap/P2 structure to obtain the
- 3 final track width.

1 17. The method of claim 2, wherein H) comprises:

- 2 i) using CMP to remove said portions of said second fill material to
- 3 expose said P2 pole.

1 18. A method for fabrication of magnetic write heads for disk drives, comprising:

- 2 A) forming a P1 layer;
- 3 B) forming an N3 layer of high magnetic moment material on said P1 layer;
- 4 C) forming a P1 Protrusion on said N3 layer, said P1 Protrusion having a
- 5 longitudinal axis;
- 6 D) depositing a gap layer on said P1 Protrusion;
- 7 E) forming a fill layer on said gap layer;
- 8 F) forming a RIE mask on said fill layer;

- 9 G) etching by RIE to remove fill layer material to form a hollow which is
10 aligned with said longitudinal axis of said P1 Protrusion;
- 11 H) removing said RIE mask;
- 12 I) filling said hollow in said fill material layer with pole material to form a
13 P2 pole;
- 14 J) etching by RIE to remove said fill layer material to leave a P1/gap/P2
15 structure which maintains alignment with said longitudinal axis of said P1 Protrusion;
- 16 K) trimming said P1/gap/P2 structure to obtain the final track width;
- 17 L) filling with second fill material around said P1/gap/P2 structure; and
- 18 M) removing portions of said second fill material to expose said P2 pole.

- 1 19. A method for fabrication of magnetic write heads for disk drives, comprising:
- 2 A) forming a P1 layer having a P1 Protrusion, said P1 Protrusion having a
3 longitudinal axis;
- 4 B) depositing a gap layer on said P1 Protrusion,
- 5 C) forming a fill layer on said gap layer, said fill layer having a protrusion
6 which is substantially aligned with said P1 Protrusion longitudinal axis;
- 7 D) forming a RIE mask on said fill layer, said mask having an opening at said
8 fill layer protrusion which maintains substantial alignment with said longitudinal axis of
9 said P1 Protrusion;
- 10 E) etching by RIE to remove fill layer material to form a hollow which is
11 aligned with said longitudinal axis of said P1 Protrusion;
- 12 F) removing said RIE mask;

- 13 G) filling said hollow in said fill material layer with material to form a P2
14 pole;
- 15 H) etching by RIE to remove said fill layer material to leave a P1/gap/P2
16 structure which maintains alignment with said longitudinal axis of said PI Protrusion;
- 17 I) trimming said P1/gap/P2 structure to obtain the final track width;
- 18 J) filling with second fill material around said P1/gap/P2 structure; and
- 19 K) removing portions of said second fill material to expose said P2 pole.